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OPPORTUNITIES FOR ASPEN FOR FURNITURE

Hugh W. Reynolds and Patrick K. Donahue[1]

ABSTRACT.--Aspen is by far the most important hardwood in Minnesota. In addition to paper and oriented strandboard, approximately 100 million board feet of aspen are sawn annually. NRRI has a research and development program to convert the best 10 percent of this aspen lumber to fine furniture. Since this 10 million board feet of lumber is only one-quarter of one percent of the total U.S. furniture used we are hunting for a small market niche.

Aspen is soft with low crushing strength so we have developed a high strength joint by laminating thin lumber to make jointed furniture part assemblies. Aspen furniture makers will buy parts from hardwood dimension companies specializing in this type of laminated parts. Finishing of the aspen parts is a part of the research and development program. This new furniture technique has been reduced to practice with a line of RTA upholstered furniture.

INTRODUCTION

Is aspen a money tree for the furniture and kitchen cabinet industries? This presentation will introduce part of the research being done at the Natural Resources Research Institute (NRRI) to increase the range of uses and thus total use of aspen lumber and aspen veneer as a raw material in two market segments: furniture and kitchen cabinets.

Aspen is by far the most important hardwood in Minnesota. While most aspen is used in making paper and oriented strandboard (OSB), a large amount, almost 100 million board feet annually, is sawn to lumber. The highest quality lumber, #1 Common & Better, is often used to make products such as pallets that could use lower quality lumber. The NRRI seeks to make greater use of the high quality aspen lumber in the furniture and kitchen cabinet industries. For aspen to be used in these markets it must perform a durable-decorative function. Our goal is to market this wood, which many people see as a "junk-wood" by converting it into a form which yields the highest value-added compared to other wood fiber products.

The development of aspen as a furniture and cabinet wood is essential for the survival of profitable mid-priced domestic produced furniture and industry. We need to convince the product managers to introduce suites of furniture and product lines featuring aspen. To do this we need a vigorous promotional effort to target this group, but first we must develop a saleable aspen product line.

Estimates of the annual consumption of high quality hardwood lumber by the furniture and kitchen cabinet manufacturers vary widely. We conservatively estimate that 10 percent of the aspen lumber sawn in Minnesota is high quality, #1 Common & Better. But this 10 million board feet of high

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quality aspen is only one-third to one-quarter of one percent of the three to four billion board feet of hardwood used by these manufacturers. So we are hunting for a small market niche in which to use Minnesota aspen and not trying to establish another Drexel or Merillat.

We have chosen ready-to-assemble (RTA) type furniture as one market niche for Minnesota high quality aspen. Dr Steve Sinclair, of VPI in Blacksburg, Virginia, has recently completed an RTA furniture survey. Sinclair found that RTA is becoming very popular and is the fastest growing segment of the furniture industry. Customers are asking for higher quality RTA and are willing to pay the higher prices. Most RTA is case goods made from medium density fiberboard. We are looking at higher quality RTA furniture made from lumber as our market niche.

VALUE-ADDED PRODUCTS

At present there are not enough high value aspen products made in the state to absorb the 10 million board feet of high quality aspen sawn each year. We do not expect that the establishment of a market for the high quality aspen will cause more high quality lumber to become available. Instead we aim to deflect the currently available high quality lumber into high value added products.

As an example, $450 of high quality aspen lumber can be made into furniture worth up to $1800, leading to additional local employment. Looking at it another way, Table 1 gives the number of board feet of material required to make $1,000 of product. This focusses on the improved efficiency and thus the importance of aspen as a furniture wood.

CHALLENGES IN USING ASPEN

Aspen has an advantage in its price and availability. Also, aspen has a very bright white color, is light, and machines well when correctly dried. However, it is not hard to find fault with aspen for furniture and cabinet manufacturing applications. Aspen is soft and of low strength compared to traditional furniture woods. While it seems true that aspen hardens with age the process of hardening is not understood. We intend to study this in the future. Aspen has history of wet pockets, being hard to kiln dry, difficult to knife machine without fuzzing, i.e., raised grain, difficult to sand, and finally all of the above make it difficult to finish, i.e., paint, stain, and top coat. The above challenges must be answered to produce a final finished product which is of interest to the decision maker - the furniture and kitchen cabinet product manager.

For any company to make a product line decision we need to provide a completely finished product with an attractive price point. If this is done, we can expect the markets to develop themselves. The estimated price of finished aspen furniture components makes aspen one of the few North American hardwoods that can compete with offshore woods, such as Malaysian-rubberwood, providing the above challenges can be met. Therefore, we can convert our low value wood into something of true value to the OEM and ultimately the customer.

Following the furniture engineering procedures established by Dr. Carl Eckelman of Purdue University we have determined that aspen cannot be used to made to make furniture using conventional joints. The crushing strength of aspen is too low to use dowel or mortise and tenon joints. We have devised a new way to make laminated aspen joints to overcome the aspen crushing strength problem.

Table 1.--Material required to make $1,000 of product.

Product	Material Required (Bd. ft.)
Boxes and crates	7,000
Flooring	4,000
Millwork	2,000
Furniture & kitchen cabinets	750

RESEARCH AND DEVELOPMENT

ASPEN RTA FURNITURE PRODUCTION PROCESS

In this process, we start with thinwood aspen pieces 3/8- or 1/2-inch thick. The piece length depends upon the furniture design but the piece width depends upon the joint strength requirement. The pieces are then laminated using conventional gluing techniques. The glued pieces, now as a flat assembly, are machined to completed parts using CNC routers. In this way the joints are a type of mortise and tenon with the mortise and tenon wider than the part width. It is this increase in joint width that creates the high strength joint.

In conventional furniture parts manufacturing, kiln dried lumber is cut and ripped to make defect free rough dimension parts. The parts are than machined to make the completed parts. These parts are joined to make the furniture. In most furniture the joints occur at high stress points, such as where a chair rail is joined to the chair back post. The furniture generally fails at a joint and not within the individual part.

Our aspen furniture is similar, the kiln dried lumber is cut and ripped to make the thinwood pieces, which are then laminated together to form a jointed rough dimension part. These "rough dimension parts" are then machined to make complete jointed parts. These parts are joined together at low stress areas to make the furniture. This joining can be done permanently with a glued lap joint or with RTA fasteners.

While aspen furniture techniques appear to be costly we have found that the cost of laminating balances out with the cost of conventional joint making. Our aspen furniture technique lends itself to part purchasing by the furniture maker. The furniture maker will buy the thin wood pieces from hardwood dimension manufacturers. The dimension manufacturers that specialize in drawer parts can furnish the thin wood pieces at effective costs. The furniture maker can send his rough dimension parts assemblies to machining centers specializing in CNC router work. Following the return of the machined parts the furniture maker will finish and assemble the components. In this way the furniture maker can concentrate on furniture design, finishing and selling with a minimum investment in wood working machinery.

The NRRI research program has reduced this new aspen furniture making technique to practice with a non-conventional stool. This stool does not have vertical legs but rather has two diagonal struts running from the top frame to the bottom frame. The joints between the struts and the top and bottom frames are areas of high stress concentration. Using four 3/8-inch ply laminated construction the stool has one and a half-inch round parts. But the joints under stress are effectively three inch wide mortise and tenon joints. The stool has been found to withstand a 2,000 pound load level safely.

Work at NRRI is continuing on innovative aspen furniture making techniques. Presently we are working on a RTA upholstered chair design that can be used as a chair, or combined into a sectional couch or conventional couch. We welcome the furniture making industry to join us in the further development of this aspen furniture making technology.

FINISHING FURNITURE AND CABINET COMPONENTS

Another challenge requiring solution is to define techniques and technologies to factory finish aspen. We plan on finishing large edge glued panel products to show manufacturers, but the alternate desired result will be to create a business which manufactures and markets completely machined and pre-finished components. Even though we would like to see smaller furniture manufacturing firms use these components, the market development will be targeted to large OEM accounts as mid dollar product line options. We do not want them to use the aspen lumber, but rather we want to convince them to specify finished products and to convince them that they cannot afford to learn all that is necessary to use aspen. The marketing goal is for them to buy specific components from regional manufacturers who have developed the specialized knowledge to fully process these components.

Our efforts are concentrating on flat line finishing equipment and the use of a ultra-violet photoactive catalyst to produce the following finishes:

1. A high-gloss wet look.
2. Stained, sealed, and top coating.
3. Oil-hand rubbed.

These pre-finished products are the back-bone of our market development projects. We try to make sure these products catch the eye of the product manager. After developing and showing samples we plan to discuss the availability and price points of aspen versus other products that are currently the mainstream of furniture and cabinet making (i.e., red oak). It is difficult to break old patterns for use, but this approach appears to be our best chance for increasing the amount used and range of uses for aspen. So far one major manufacturer is seriously considering aspen for a new suite of furniture. This manufacturer has a new flat line finishing system which will paint the aspen with a wet look finish. Only time will tell if this industrial development project will be successful but we believe that furniture and cabinets made from an all U.S. hardwoods at a price point equivalent to off shore products will find its place in the market.